VERIFIED STATEMENT OF TRANSLATION

I, Toshio YAMAMOTO, hereby state and declare that:

1) I prepared the English language translation of certified copy of Japanese Patent Application 2002-194,986, filed July 3, 2002, and this translation is being filed with this declaration; and

2) I believe the translation of the certified copy of the noted Japanese application is accurate.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United states Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

February 4, 2005.
Date

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WITNESS: Akio Yamamoto
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[Name of Document] APPLICATION FOR LETTERS PATENT

[Case Number] 7027

[Date] July 3, 2002

[Address] Director General of Patent Office: Kouzo Oikawa

[Int'l Classification] F02M 19/00

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[Indication of Official Fee]

[Prepayment File Number] 036205

[Amount of Fee] ¥ 21,000.

[Contents of Attached Documents]

[Document] Specification one-note

[Document] Drawings one-note

[Document] Abstract one-note

[Number of Power of Attorney] 9909873

[proof] required

[Name of document] Specification 02-194986

[Name of the invention] A stratified scavenging mechanism of a two-stroke internal combustion engine

[What claimed is]

[CLAIM 1]

A stratified scavenging mechanism of a two-stroke internal combustion engine comprising a carburetor having a throttle valve for supplying and controlling air fuel mixture and a passage member having an air control valve, characterized in that said passage member is integrated with the carburetor through carburetor constituting parts, and said throttle valve and said air control valve are operatively connected, after the air control valve is assembled.

[CLAIM 2]

The stratified scavenging mechanism of a two-stroke internal combustion engine according to claim 1, wherein said air control valve is integrated with said carburetor through a pump cover plate.

[CLAIM 3]

The stratified scavenging mechanism of a two-stroke internal combustion engine according to claim 1, wherein said air control valve is integrally molded with said pump cover plate.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[INDUSTRIAL FIELD]

This present invention relates to a stratified scavenging mechanism of a two-stroke internal combustion engine, and particularly to a stratified scavenging mechanism of a two-stroke internal combustion engine for facilitating an assembling of a carburetor with an air passage relative to the engine.

[0002]

[PRIOR ART]

In order to prevent a blow-through of fuel at the time of scavenging in the stratified scavenging two-stroke internal combustion engine, a stratified scavenging mechanism has been known in which an air passage is provided separately from an air fuel mixture passage, an air stratification and a mixture stratification are formed in a stratified fashion in a crank chamber, scavenging is done with the air stratification in begining of the scavenging, and then scavenging and suction are done with the mixture stratification.

[0003]

As the stratified scavenging mechanism of this kind, there have been known a configuration in which an air control valve or an air control mechanism is arranged on the side of an insulating pipe (an insulator) (Japanese Patent Laid-Open No. 2000-186559 Publication), a configuration in which they are integrated with a carburetor body, (Japanese Patent Laid-Open No. 2000-282874 Publication), and a configuration in which they are held by a carburetor on the side of an air cleaner (Japanese Patent Laid-

Open No. 8-106186 Publication), and the like.

[0004]

[PROBLEM TO BE SOLVED BY THE INVENTION]

The object of the present invention is to provide a stratified scavenging mechanism of a two-stroke internal combustion engine in which an air control valve is integrally held on a part constituting a carburetor, for example, a pump cover plate to thereby improve the assembling properties to the carburetor, and the mounting properties to the engine.

[0005]

[MEANS FOR SOLVING THE PROBLEM]

In order to accomplish the above object of the present invention, there is provided a stratified scavenging mechanism of a two-stroke internal combustion engine comprising a carburetor having a throttle valve for supplying and controlling air fuel mixture and a passage member having an air control valve, characterized in that said passage member is integrated with the carburetor through carburetor constituting parts, and said throttle valve and said air control valve are operatively connected, after the air control valve is assembled.

[0006]

[MODE FOR CARRYING OUT THE INVENTION]

In the present invention, a passage member for supporting an air control valve is constituted separately from a pump cover plate of a carburetor, and the passage member is secured to the

pump cover plate by means of bolts as a fixedly mounting mechanism, or a passage member is molded integral with a pump cover plate, and the pump cover plate is secured to a carburetor body by means of bolts as a fixedly mounting mechanism.

[0007]

That is, the passage member is secured, in advance, to the pump cover plate by means of the fixedly mounting mechanism, or the pump cover plate integral with the passage member is secured to the carburetor body by means of the fixedly mounting mechanism. Then, for example, the air cleaner, the carburetor body and the insulator pipe are placed face to face, and connected to the engine by a pair of left and right through-bolts. An outlet of the passage member is connected to a scavenging port of the engine by an air pipe, and an inlet of the passage member is connected to the air cleaner. This enables facilitation of the assembling properties of the passage member having an air control valve to the carburetor body, and the mounting properties of the passage member to the engine.

[0008]

A throttle valve lever of the carburetor and an air control valve lever of the passage member are interlocked and connected by a link, and a connecting portion between one of the levers and the link is provided with a slot so that the air control valve lever is delayed to rotation with respect to the throttle valve lever in an opening direction from an idle position.

[0009]

[EMBODIMENT]

As shown in FIG. 1, the carburetor is such configured that a butterfly type throttle valve 4 is supported by a valve shaft 3 on the outlet side of an air intake passage 2 extending through a carburetor body 1 in a lngitudinal direction, whereas a butterfly type choke valve (not shown) is supported by a valve shaft 17 on the inlet side of the air intake passage 2. A return spring 9 is wound about an outer end portion of the valve shaft 3, and a throttle valve lever 10 is connected thereto. One end and the other end of the return spring 9 are fastened to the carburetor body 1 and the throttle valve lever 10, respectively, and the throttle valve 4 is exerted in rotation to the idle position, shown in FIG. 1 by the force of the return spring 9. At this time, the throttle valve lever 10 is placed in contact with a conical cam surface of an idle stop bolt 14 threadedly supported on the side wall portion of the carburetor body 1. An idle position (an opening degree of the throttle valve 4) of the throttle valve lever 10 is adjusted by loosening or tightening the idle stop bolt 14. A spring 15 is, similarly to the return spring 9, wound about the outer end portion of the valve shaft 17 which is substantially parallel with the valve shaft 3 and a lever 16 is connected thereto. The choke valve is exerted in rotation to a fully open position by the force of the spring 15. A low speed fuel adjust needle valve 12 and a high speed fuel

adjust needle valve 13 which are described later are provided on the side wall portion of the carburetor body 1.

[0010]

A pump cover plate 20 is connected by a bolt 21 to the upper end surface of the carburetor body 1 through a diaphragm 18 to constitute a fuel pump 23. On the upper side of the diaphragm 18 is defined a pulsation pressure chamber, and pulsation pressure of a crank chamber of the two-stroke engine is introduced via an introducing pipe 22. On the lower side of the diaphragm 18 is defined a pump chamber, fuel of a furl tank, not shown, is taken into the pump chamber via a fuel pipe 19 as the diaphragm 18 vibrates up and down, and is discharged to a fuel metering chamber of a constant pressure fuel supply mechanism 8 connected to the lower wall surface of the carburetor body 1. The constant pressure fuel supply mechanism 8 has a lower plate 7 connected to the lower end surface of the carburetor body 1 through a diaphragm 6, and a fuel metering chamber and an atmospheric chamber are defined on the upper side and lower side, respectively. Although not shown, the fuel metering chamber is provided with a lever mechanism which tilts in response to a vertical displacement of the diaphragm 6, and an inlet valve opened and closed by the lever mechanism, and fuel from the fuel pump 23 is supplied to the constant pressure fuel chamber via the inlet valve.

[0011]

The fuel of the constant pressure fuel chamber is supplied to the air intake passage 2 via the low speed fuel adjust needle valve 12 and a low speed fuel orifice opened near a closed position of the throttle valve 4 of the air intake passage 2. Further, the fuel of the constant pressure fuel chamber is supplied to the air intake passage 2 via the high speed fuel adjust needle valve 13 and a high speed fuel orifice disposed in a Venturi portion between the throttle valve 4 and the choke valve in the air intake passage 2.

[0012]

According to the present invention, mounted on the pump cover plate 20 is a passage member 24 for introducing air for delivering a combustion gas to an exhaust port prior to a mixture to a scavenging port, in the process of downward movement of a piston of the two-stroke engine. In the passage member 24, a vertical wall 24a having an opening 26 in the center between left and right, a pair of left and right apertures 25, and a base plate 28 placed on the pump cover plate 20 are integrally molded of a synthetic resin, an aluminum alloy or the like. A plurality of reinforcing ribs 27 are disposed on the connecting portion between the vertical wall 24a and the base plate 28.

[0013]

The base plate 28 is placed on the pump cover plate 20 and secured by the bolt 21. In the illustrated embodiment, for example, a locating pin projecting downward from the base plate

28 is engaged with a pin hole of the pump cover plate 20, and the base plate 28 is placed on a prescribed position of the pump cover plate 20 and secured by the single bolt 21. A butterfly type air control valve 29 is supported in the opening 26 by a valve shaft 30, a return spring 31 is wound about the outer end of the valve shaft 30 and a air valve lever 32 is connected thereto. One end and the other end of the return spring 31 are fastened to the vertical wall 24a and the air valve lever 32, respectively, and the air control valve 29 is exerted in rotation to a closed position by the force of the return spring 31. A slot 32a is provided on the end of the air valve lever 32.

[0014]

The air valve lever 32 and the throttle valve lever 10 are operatively connected by a link 33. That is, one end of the link 33 is connected to the throttle valve lever 10 so as to be free from a play, and the other end of the link 33 is connected to a slot 32a of the air valve lever 32 so as not to be disengaged. The slot 32a is determined in length so that the throttle valve 4 and the air control valve 29 satisfy a predetermined opening degree condition. That is, when the throttle valve 4 is at an idle position, the end of the link 33 engages the upper end edge portion of the slot 32a, and when the throttle valve 4 is turned in an opening direction by the throttle valve lever 10 and when the opening degree of the throttle valve 4 exceeds a predetermined value, a bend piece of the end of the link 33 comes

in contact with the lower end edge portion of the slot 32a, and then the opening degree of the air control valve 29 also increases according to the opening degree of the throttle valve 4. Alternately, the slot 32a may be provided on the end of the throttle valve lever 10, and a play may be provided between the lever 10 and the link 33.

[0015]

The vertical wall 24a of the passage member 24 has the plate thickness enough to support the air control valve 29, and one end flange of an air pipe made of synthetic resin, an aluminum alloy or the like is placed on and connected to the front surface of the vertical wall 24a, and the other end flange of the air pipe is connected to a scavenging port of the engine. The rear surface of the vertical wall 24a is connected to the air cleaner. The air cleaner and the heat insulator pipe are faced to the rear surface and the front surface, respectively, of the carburetor body 1, and are connected to the suction port of the engine by through bolts extending through a pair of left and right apertures 5.

[0016]

In the present invention, the passage member 24 is configured integral with the carburetor body 1, and an air pipe different in length from the insulator pipe is connected between the passage member 24 and the scavenging port of the engine. Therefore, if the air cleaner, the carburetor body 1 and the

insulator pipe are placed face to face and secured to the suction port of the engine, and then the air pipe is connected between the passage member 24 and the scavenging port of the engine, mounting operation is easy, and particularly if a flexible air pipe is used, even if the specification of the engine, for example, the vertical spacing between the suction port and the scavenging port is somewhat different from the vertical spacing between the air intake passage 2 and the opening 26, the mounting operation becomes easy.

[0017]

In the illustrated embodiment, the vertical wall 24a of the passage member 24 is disposed at the rear of the carburetor body 1, but where an inclination of the valve shaft of the carburetor body 1 is different, if the direction of the passage member 24 is changed, the former may be disposed in front of the carburetor body 1 (to the engine side).

[0018]

In the embodiment shown in FIG. 2, a configuration in which the pump cover plate 20 and the vertical wall 24a of the passage member 24 are integrated and fixedly mounted to the carburetor body 1. The connecting portion between the pump cover plate 20 and the vertical wall 24a is strengthened by an inclined wall 24b.

[0019]

[EFFECT OF THE INVENTION]

As mentioned above, the present invention provides a stratified scavenging mechanism of a two-stroke internal combustion engine comprising a carburetor having a throttle valve for supplying and controlling a mixture and a passage member having an air control valve disposed thereon, wherein the passage member is assembled on the carburetor body through carburetor constituting parts after the air control valve is assembled on the passage member, because of which the assembling properties are excellent, and the structure can be light-weighted.

[0020]

Since the pump cover plate and the passage member are integrally molded, there is an advantage that the workability is easy, also being useful for light-weighting.

[0021]

It is also possible, depending upon the demand in terms of a rigging of the engine, to rotate the passage member by 180 degree on the horizontal surface to dispose the vertical wall on the engine side.

[0022]

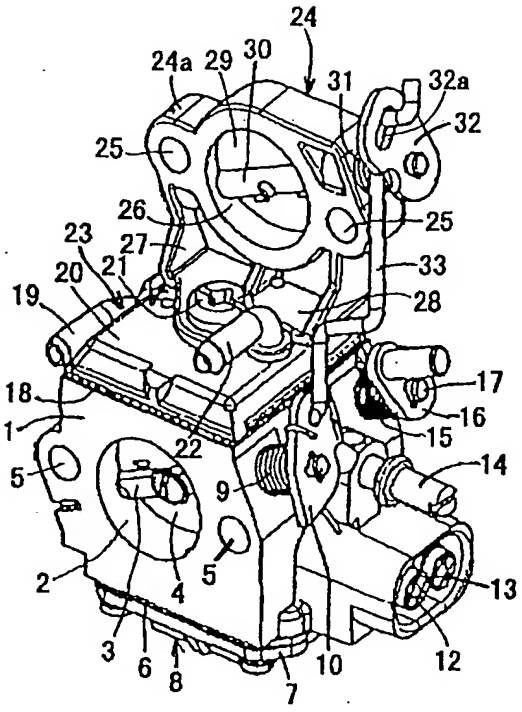
There is provided a play in the link for interlocking and connecting the throttle valve lever and the air control valve lever to thereby suppress making a mixture lean at the time of starting the engine and in the idle operation to stabilize the engine.

[BRIEF DESCRIPTION OF THE DRAWINGS]

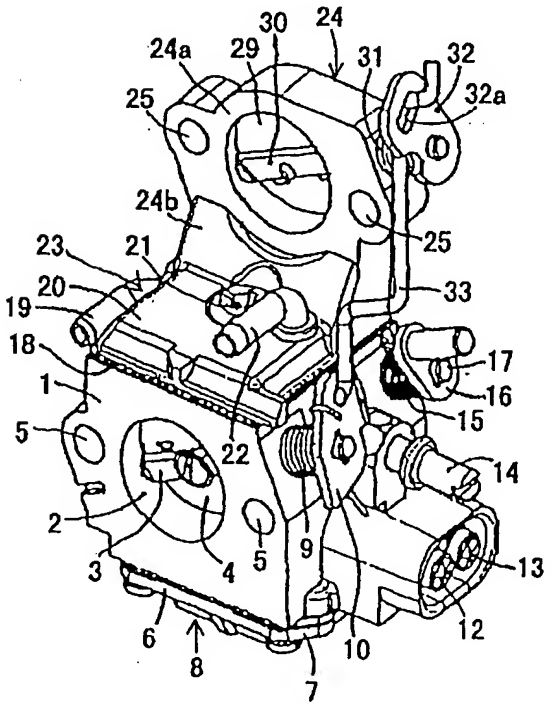
FIG. 1 is a perspective view of a carburetor provided with a stratified scavenging mechanism of a two-stroke internal combustion engine according to the present invention.

[Name of Document] Drawings

[FIG. 1]



[FIG. 2]



VERIFIED STATEMENT OF TRANSLATION

I, Toshio YAMAMOTO, hereby state and declare that:

1) I prepared the English language translation of certified copy of Japanese Patent Application 2002-311,358, filed October 25, 2005 and this translation is being filed with this declaration; and

2) I believe the translation of the certified copy of the noted Japanese application is accurate.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United states Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

February 4, 2005.
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[Name of Document] APPLICATION FOR LETTERS PATENT

[Case Number] 7049

[Date] October 25, 2002

[Address] Director General of Patent Office: Shinichiro Ota

[Int'l Classification] F02M 9/00

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[Contents of Attached Documents]

[Document] Specification one-note

[Document] Drawings one-note

[Document] Abstract one-note

[Number of Power of Attorney] 9909873

[proof] required

[Name of document] Specification 02-311358

[Name of the invention] A stratified scavenging mechanism of a two-stroke internal combustion engine

[What claimed is]

[CLAIM 1]

A stratified scavenging mechanism of a two-stroke internal combustion engine comprising a carburetor having a throttle valve for supplying and controlling air fuel mixture and an air passage in which an air control valve is disposed, characterized in that a plurality of air passages are provided on a scavenging air supply body, an air valve for opening and closing the air passage in synchronism is disposed in each air passage, an air valve lever is connected to an outer end portion of a valve shaft for fixedly mounting said air valve, said air valve lever is operatively connected to a throttle valve lever by a link, and the scavenging air supply body is such that a portion for connecting the air passages is secured to the carburetor through carburetor constituting parts.

[CLAIM 2]

The stratified scavenging mechanism of a two-stroke internal combustion engine according to claim 1, wherein one end of said link is engaged with a slot provided on one of the air valve lever and the throttle valve lever, and the air valve is interlock with the throttle valve in the operating region in which an opening degree of the throttle valve is in excess of a

predetermined valve.

[DETAILED DESCRIPTION OF THE INVENTION]

[0001]

[INDUSTRIAL FIELD]

The present invention relates to a stratified scavenging mechanism of a two-stroke engine, and particularly to a stratified scavenging mechanism of a two-stroke engine in which there are provided a plurality of air passages to increase scavenging air quantities, and the assembling properties of the scavenging air supply body are improved.

[0002]

[PRIOR ART]

Conventionally, a stratified scavenging mechanism has been known as disclosed in Japanese Patent Laid-Open No. 2000-314350 wherein in a stratified scavenging mechanism of a two-stroke engine, an air passage is provided separately from a mixture passage in order to prevent a blow-through of fuel at the time of scavenging, scavenging is done with an air stratification at the outset of scavenging, and afterward, scavenging is done with a mixture stratification, and air is taken into a crank chamber.

[0003]

The present applicant has applied for a stratified scavenging mechanism of a two-stroke engine under Japanese Patent Application No. 2002-194986 which is provided with a scavenging air supply body which can be mounted easily on a conventional

carburetor. However, in the aforementioned stratified scavenging mechanism of a two-stroke engine, where a large quantity of scavenging air are necessary, it was necessary to widen a sectional area of the air passage, but there was a problem that when the inside diameter of the passage in a single air passage is made large, a spacing "L" between the center of an intake passage of the carburetor and the center of the air passage becomes so large that not only the size becomes large but also of mounting with respect to the engine becomes difficult.

[0004]

[PROBLEM TO BE SOLVED BY THE INVENTION]

The object of the present invention is to provide a stratified scavenging mechanism of a two-stroke engine in which a plurality of air passages are provided on a scavenging air supply body in order to increase a supply quantity of scavenging air, and it is secured to carburetor constituting parts between portions for connecting the air passages.

[0005]

[MEANS FOR SOLVING THE PROBLEM]

In order to accomplish the above object of the present invention, there is provided a stratified scavenging mechanism of a two-stroke internal combustion engine comprising a carburetor having a throttle valve for supplying and controlling air fuel mixture and an air passage in which an air control valve is disposed, characterized in that a plurality of air passages are

provided on a scavenging air supply body, an air valve for opening and closing the air passage in synchronism is disposed in each air passage, an air valve lever is connected to an outer end portion of a valve shaft for fixedly mounting said air valve, said air valve lever is operatively connected to a throttle valve lever by a link, and the scavenging air supply body is such that a portion for connecting the air passages is secured to the carburetor through carburetor constituting parts.

[0006]

[MODE FOR CARRYING OUT THE INVENTION]

In the present invention, a plurality of air passages are provided on a scavenging air supply body, and an air valve for opening and closing the air passage in synchronism is disposed on each air passage. An air valve lever connected to an outer end of a valve shaft for fixedly holding the air valve is operatively connected to a throttle valve lever by a link to increase a quantity of scavenging air. The scavenging air supply body is secured to the carburetor body through carburetor constituting parts between portions for connecting the air passages each other, and the assembling properties of the scavenging air supply body are improved.

[0007]

The throttle valve lever of the carburetor and the air valve lever of the scavenging air supply body are operatively connected by the link, a slot is provided in a connecting portion

between one of the levers and the link, and the air valve lever is delayed in rotation respect to the throttle valve lever from an idle position to an opening direction.

[0008]

[EMBODIMENT]

As shown in FIG. 1, the carburetor provided with the stratified scavenging mechanism is such configured that a butterfly type throttle valve 4 is supported by an inclined valve shaft 3 on the outlet side of an air intake passage 2 extending through a carburetor body 1 in a longitudinal direction, and, a butterfly type choke valve (not shown) is supported by a valve shaft as necessary on the inlet side of the air intake passage 2. A return spring is wound about an outer end portion of the valve shaft 3, and a semi-disk like throttle valve lever 10 is connected thereto. The throttle valve 4 is exerted in rotation to the idle position, as shown in FIG. 3 by the force of the return spring. At this time, the throttle valve lever 10 is placed in contact with the conical surface of an idle stop bolt 14 threadedly supported on the side wall of the carburetor body 1. When the idle stop bolt 14 is loosened or tightened, the idle position (idle opening degree of the throttle valve 4) of the throttle valve lever 10 is adjusted. A low speed fuel adjust needle valve 12 and a high speed fuel adjust needle valve 13 are provided on the side wall portion of the carburetor body 1. On the upper end of the carburetor body 1, a pump cover plate 20 is

connected by a bolt 57 through a diaphragm 18 to constitute a fuel pump 23.

[0009]

According to the present invention, mounted on the pump cover plate 20 is a passage member or a scavenging air supply body 48 for introducing air for delivering a combustion gas to an exhaust port prior to a mixture to a scavenging port in the process of downward movement of a piston of the two-stroke engine. In the scavenging air supply body 48, a plurality of, a pair of left and right tubes 49a, 50a in the illustration are integrally molded of synthetic resin, an aluminum alloy or the like.

[0010]

Butterfly type air valves 51 and 52 are supported on the tubes 49a and 50a by a valve shaft 30 across the air passages 49 and 50, a return spring 31 is wound about the outer end of the valve shaft 30, and the air valve lever 32 is connected thereto. One end and the other end of the return spring 31 are fastened to the wall portion and the air valve lever 32, respectively, and the air valves 51 and 52 are exerted in rotation to a closed position by the force of the return spring 31. The air valve lever 32 is formed with a slot 32a.

[0011]

The air valve lever 32 and the throttle valve lever 10 are operatively connected by a link 33. That is, one end of the link

33 is connected, free from a play, to one of a plurality of holes 46 juxtaposed in the peripheral direction in the throttle valve lever 10, and the other end of the link 33 is connected with a play to a slot 32a of the air valve lever 32 so as not to be disengaged. The length of the slot 32a is determined so as to satisfy with the predetermined opening-degree condition of the throttle valve 4 and the air valves 51 and 52. That is, when the throttle valve 4 is at an idle position, the end of the link 33 is engaged with the upper end edge of the slot 32a, and when the throttle valve 4 is turned in the opening direction by the throttle valve lever 10 and when the opening degree of the throttle valve 4 exceeds the predetermined value, the bent piece of the end of the link 33 comes in contact with the lower end edge of the slot 32a against the force of the return spring 31, and the opening degree of the air valves 51 and 52 also increases depending on the opening degree of the throttle valve 4. Alternatively, the slot 32a may be provided in the end of the throttle valve lever 10 in place of the air valve lever 32, and a play may be provided between the former and the link 33.

[0012]

The scavenging air supply body 48, shown in FIG. 3, has the plate thickness merely enough that the connecting portion 48a connects the tubes 49a and 50a, the base plate 48b is formed integral with the lower end of the connecting portion 48a and is put on the pump cover plate 20 and fastened to the carburetor

body 1 by means of a single bolt 57. An air pipe having a connecting part formed from a synthetic resin pipe is externally fitted over the tubes 49a and 50a, the air pipe being communicated with a scavenging port of the engine. The upstream of the tubes 49a and 50a is connected to an air cleaner. The air cleaner faces to the back surface of the carburetor body 1, as shown in FIG. 3, and an insulator pipe faces to the front surface of the carburetor body 1, and are connected to the wall part surrounding the intake port of the engine by a pair of through-bolts extending through left and right apertures 5.

[0013]

In the present invention, the scavenging air supply body 48 is formed integral with the carburetor body 1, and an air pipe different in length from the aforementioned insulator pipe is connected between the scavenging air supply body 48 and the scavenging port of the engine. Therefore, if first, the air cleaner, the carburetor body 1 and the insulator pipe are placed face to face and secured to the intake port of the engine, after which the air pipe is connected between the scavenging air supply body 48 and the scavenging port of the engine, mounting operation is easy, and particularly, if a flexible air pipe is used, mounting operation is easy even if a vertical spacing between the intake port and the scavenging port is somewhat different from a vertical spacing "L" between the air intake passage 2 and the tubes 49a and 50a.

[0014]

[EFFECT OF THE INVENTION]

In the present invention, as described above, where a large quantity of scavenging air are necessary, a plurality of air passages are provided to thereby enable making the diameter of each air passage small, and therefore, the spacing "L" between the center of the air intake passage of the carburetor and the center of the air passage is small to enable making the structure small, and when the carburetor is mounted on the engine, screw-mounting between the air passages can be achieved, improving the mounting properties.

[0015]

In mounting the scavenging air supply body on the carburetor constituting parts, the connecting portion between both air passages may be fastened to the carburetor constituting parts such as a pump cover plate, and in case of a single air passage, a small structure may be employed as compared with the case where it has to be fastened avoiding the air passage, and in addition, the number of fastening places can be reduced.

[0016]

It is general that in the normal engine, there are a plurality of scavenging ports. Where scavenging air is supplied from a single air passage to the plurality of scavenging ports, the scavenging air passage becomes complexed in order that the scavenging air is distributed, whereas if the scavenging air is

supplied from a plurality of air passages to the scavenging ports, not only the scavenging passages of the engine can be simplified, but also the suction resistance of the scavenging air can be made small.

[BRIEF DESCRIPTION OF THE DRAWING]

FIG. 1 is a perspective view of a carburetor provided with a stratified scavenging mechanism of a two-stroke internal combustion engine according to the present invention.

FIG. 2 is a perspective view of a carburetor provided with a stratified scavenging mechanism of a two-stroke internal combustion engine according to a second embodiment of the present invention.

[Name of Document] Drawing

[FIG. 1]